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**THE EFFECT OF VOTING ADVICE APPLICATIONS ON ESTONIAN
VOTERS' VOTING BEHAVIOUR**

MA thesis

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I have written this Master's thesis independently. All viewpoints of other authors, literary sources and data from elsewhere used for writing this paper have been referenced.

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Abstract

In the age of digitalisation and information overflow, it might be difficult for people to decide which information to consume and trust. However, next to all of that, we still have to make important decisions and one of them taking part in elections.

In recent years, Voting Advice Applications or VAAs, as they are usually abbreviated, have become increasingly popular among voters in many countries. It is not an exaggeration to say that they are now the real part of how a voter makes his or her voting decision. The typical reason for this tends to be the fact that using VAA is rational for a voter: s/he gets the information from one place, and what is even more important, based on his or her opinions on certain matters, the program matches and also compares voter's views to the ones of political party or candidate.

Yet, quite little is known about the impact of VAAs. The aim of my master thesis is to contribute to the investigation of VAAs and have a look at their impact on Estonian voters' voting behaviour. To do so, I will be using two datasets: panel data from European Parliament elections in 2014 and survey data on Estonian national elections in 2015. It is worth noting that in Estonia's case panel data has not studied before in order to see the possible effect of VAAs on voting behaviour.

I will pose three questions in my thesis: how do VAAs influence voting turnout, how do they change voter's choice set, and finally, if VAAs have any effect on final vote choice.

From statistical point of view, the results of my analysis are mostly insignificant. Leaving this aside, I found that based on those two datasets VAAs act more like a control mechanism: those people who already have decided to go to vote also tend to use VAA, also there is mostly no change in their choice set. One reason for this can be found from so called bottleneck theory – people who are more exposed to information, internet usage and different possibilities are therefore also less affected by VAA as it is one competing information source. From the other hand, those people, who are more likely to be affected by VAA, are not exposed to it and therefore I could not see effect of it on voting behaviour.

In terms of final vote choice, I noticed that those people who used VAA were also more likely to change their final vote choice. However, as it was statistically insignificant, I cannot say that it translates to the whole population.

Introduction

The ways how we form our political preferences and why we change them has been a compelling topic for researches for a long time. This comes mostly down to the fact that there are many variables that play the role in shaping our voting behaviour.

As the time has moved on, the variety of information that people can consume and have access to has become enormous. We may read print media, watch TV debates, scroll through and read social media and discuss politics with friends and family. This, of course, is not a final list and getting information and forming knowledge is way bigger and more complicated process.

However, surviving in this mix of information might not be easy. As we think about one of the main citizen duties, participating in elections, the decision who to vote for might not come so easily for people. Already in 1980s, political scientists decided to give a helping hand to voters and came out with a simple paper and pencil test that later formed into Voting Advice Application or VAA, as it is usually abbreviated. In short, it is a helping tool for people to see what political party or candidate matches the most with his or her political stances. The results are presented usually on the basis of a simple and usually quite quick test.

VAAs have become a real part of political decision making for many people. From the perspective of academia, the most common explanation for this has been explaining it through comparison of the cost and utility of taking VAA and going voting. Simply put, if the effort one has to give is smaller than the utility what voter might get from voting for a party or candidate, s/he goes to vote. In this case, VAAs are helpful tools as they help to decrease the amount of time one has to take to search and compare stances of political parties or candidates.

Voting Advice Applications are also widely understood as competing information sources. That means that VAA is only one possible medium of getting information on political parties or candidates and their views. However, compared to for example news papers or TV shows, VAA gives comparative information and has gathered and created a list of all participating parties or candidates and their views.

Other possible option of understanding the effect of VAAs on voting behaviour, is for example issue voting. Issue voting may be referred more to making the final vote choice

in the voting booth (or in Estonia's case also at home, work, school or forest). VAAs inform people on certain matters and a voter finds out that some other party or candidate stands closer to him or her in such questions that matter the most for the voter.

In general, scholars have agreed that VAAs have an impact on voters' voting behaviour, however, much is yet to discover. The aim of this master thesis is to analyse, whether and how VAAs influence voters' party and policy preferences.

In this thesis I am going to answer the research questions based on two datasets. The first one being panel data on European Parliament elections in 2014 and the second one survey data on Estonian national elections in 2015.

The novelty of my research is that panel data has not tested before to test the effect of VAAs on Estonian voters.

Voting behaviour as such, however, is a very large topic. For my theses I have narrowed it down to three main questions: how do VAAs influence turnout; how do VAAs influence voter's choice set; how do VAAs influence final vote choice.

My thesis will be divided into three main parts: theoretical part when I briefly introduce the concept and also history of VAAs, then I will continue with theoretical framework on how VAAs affect voting behaviour; the second section will be devoted to analysis; third and final section will be about results, summary and conclusion.

Theory of VAA usage

To have a look at more thorough insight to the VAAs and their effect on voting behaviour, it would be suitable to have a look at what VAAs are. Also, in this section I will give a brief overview of the history of VAAs that reaches back into 1980s when the first, so called offline version of VAA was issued. However, as can be seen below, VAAs were not as intriguing to voters before they found their new home on the Internet. After that, millions of people started using VAAs and now in some countries they seem to be almost like a ‘real part’ of the voting behaviour. As Dinas et al (2014: 2) note, “citizens start using these tools repeatedly, and on a structural basis, before elections. In a way, for a growing part of the electorate these tools have become fully embedded elements of the electoral process”.

What are VAAs?

As several authors (Marschall and Garzia, 2014; Gemenis 2014, to name few) who study VAAs have noted, the age of Internet and wider digitalisation have also had an impact on voting behaviour and the way people gather information. “The more people have used the net for their political communication and for collection of information, the larger the potential VAA user-group has become” (Marschall and Garzia 2014: 4).

In addition to traditional media sources like television, radio, newspapers, we also have social media, web forums etc. However, more widely, especially during the last decade, an additional source has been emerging, namely Voting Advice Applications or simply VAAs.

As Marschall and Garzia (2014: 1) write, VAAs are applications that “assist voters in the electoral decision by comparing their policy preferences with the programmatic stances of political parties and/or candidates”. Israel et al (2014: 56-57) add that “VAAs are issue-based tools as they provide only information on the different programmatic positions of the parties running for elections, and their proximity to the voters’ policy positions decides which party is “recommended” to the user”.

As electoral campaigning is to a very large extent done also online, VAAs have gained importance in the whole electoral campaigning time and process as more and more people are using VAAs (Garzia and Marschall 2012).

Marschall and Garzia (2014: 1-2) write that in some countries like Netherlands (VAA named Stemwijzer) or Germany (Wahl-O-Mat) VAAs have become very popular and millions of voters are using them during the election time.

Brief history of VAAs

VAAs are rather new phenomena and they started taking more ground as they were digitalised. Namely, as Gemenis (2014: 1) notes, VAAs already reach back to 1980s, in a form of simple pencil and paper tests. At that time, they were not very compelling and interesting for voters to use. Marschall and Garzia (2014: 2) call it the “offline” period of VAAs.

According to Marschall and Garzia (2014: 2) StemWijzer is the ‘ancestor’ of all VAAs. It was “developed in 1989 by the Dutch Stichting Burgerschapskunde in collaboration with the Documentatiecentrum Nederlandse Politieke Partijen and the faculty of Political Management at the University of Twente”. At that time, VAA was only a “small booklet with 60 statements taken from political party manifestos and a diskette” (ibid.). A digital version of StemWijzer was released a few years later for the 1998 parliamentary elections. Using VAA started to become more and more popular among Dutch voters (ibid.).

Garzia and Marschall (2012: 205), mention that “except for a few cases, nearly all of the tools have been established after 2000”. By few cases they mean Finland and Netherlands. However, as VAAs took digital form, people started using them more and more. Marshall (2014) writes that VAAs have become an important part in many European countries as they are popular. Gemenis (2014: 2) says that “usage figures exceeding one quarter of the electorate in Belgium, Finland, Germany, the Netherlands, and Switzerland”.

In this case, one has to mention that VAAs have not only been used exclusively on national level. Before the EU elections of 2009, a supranational VAA was launched under the auspices of the Florence-based European University Institute (Marschall and Garzia 2014: 2). “In only six weeks, the EU Profiler was able to attract more than 2.5 million users from all around the continent” (ibid.). Another tool, VoteMatch Europe was offered for the same elections. For the European Elections of 2014, “several initiatives have been launched offering national as well transnational Voting Advice Applications throughout Europe” (ibid.).

VAA in Estonia and abroad

VAA in Europe have had almost like a snowball effect. They were first used in Netherlands, then they started emerging in other countries as well as it was seen that they are useful and also popular among people.

In this section I have already mentioned that among Germans, using VAA is also popular (Wahl-O-Mat). However, VAAs have been created also in Bulgaria (Glasovoditel), Switzerland (Politarena), Belgium (in 2004 Flemish public broadcaster VRT issued Doe de Stem Test! for the regional elections held that year). An example closer to Estonia would be Finland, that developed the first VAA already in 1996 (Marschall and Garzia 2014: 2). For 1999 European Parliament elections, Helsingin Sanomat developed also a VAA (ibid.). According to Ruusuvirta (2010, from Marshall and Garzia 2012:1), more than 20 applications were available for Finnish voters. According to Marschall and Garzia (2014), VAAs are also available in Belgium, France, Portugal, Sweden, Turkey, and also Arabian and South American countries, which means that their scope has become really wide.

This thesis, however, is about Estonia. Voting Advice Applications have been used by Estonian voters already from 2009, when the EU Profiler was created for the European Parliament elections. However, as Vassil (2011: 140) writes, the popularity of it was quite low as it was used only 1627 times during the availability of it. The second VAA, “EU and I” was also available in Estonia. In this thesis I am going to analyse how VAAs www.euandi.err.ee and www.euvowx2014.eu influenced voting behaviour.

Much bigger numbers, however, wait for us when we have a look at following VAAs. First Valijakompass was issued in 2011 for national elections and the second Valijakompass for 2015 elections. The latter has been used over 100 000 times¹. In 2015 there was also another VAA, called Valimismootor, developed by non-profit organisation MTÜ Valimisvaatlus².

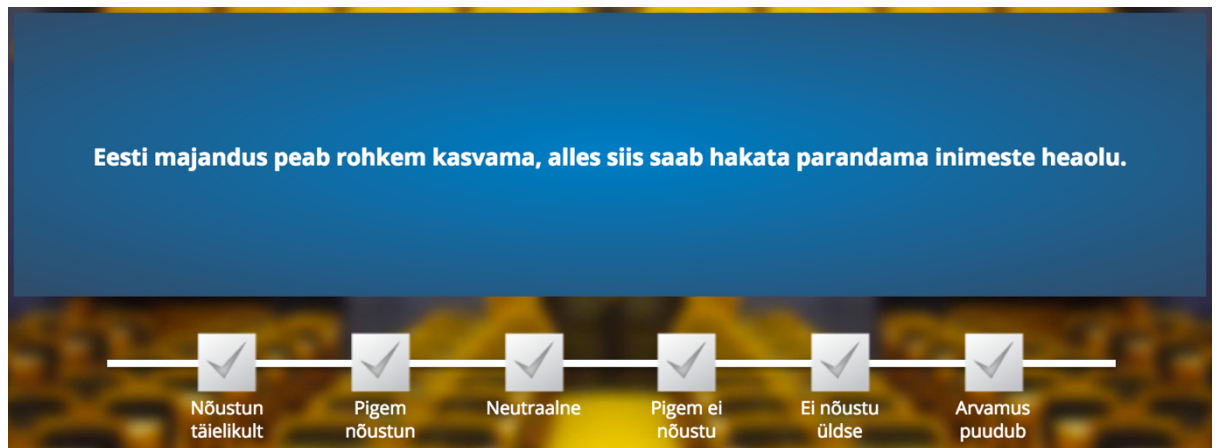
How do VAAs work?

Even though the form of VAAs might be a bit different, the basics of the functioning of a VAA are quite the same. Garzia et al (2014) note that “VAAs share a common

¹ See on: <http://valijakompass.dev.err.ee/>

² See on: <http://www.delfi.ee/news/riigikogu2015/mootor/>

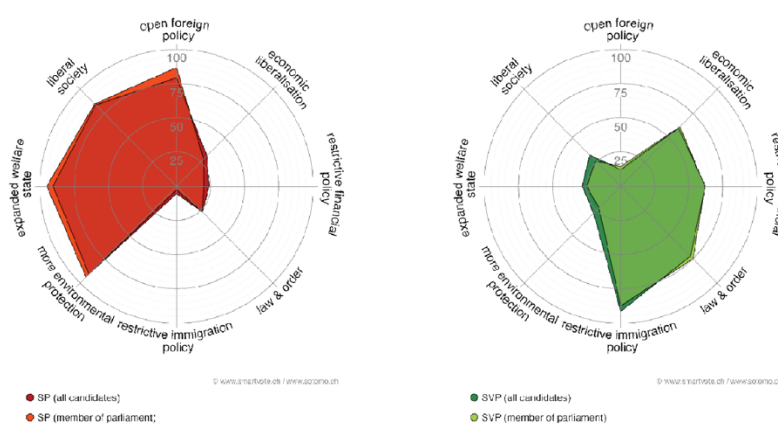
underlying principle: they help users casting a vote by comparing their policy preferences on major issues with the programmatic stances of political parties on the same issues”.



Picture 1. Example of question in VAA. It states: Estonian economy should grow before we can start increasing the well-being of people. Below, six variants of answers (from left): complete agreement, quite agree, neutral, not quite agree, complete disagreement, no opinion.

In order to make sure voter's political preferences and match with party (or in some cases candidate) voter shows his/her agreement or disagreement with a political statement. The exact number of issues or statements varies from one VAA to another but usually it is between 10 and 70. Marschall and Garzia (2014: 1) give some examples of statements: “social programmes should be maintained even at the cost of higher taxes” or “abortion should be forbidden”.

After the voter has marked his/her opinion about given issues, the choices are matched with positions of political parties/candidates. Eventually voter can see the so called match list and have a look at what kind of political parties/candidates stand close to him/her. Some other graphical representations exist, as well (Garzia et al 2014: 26; Marschall and Garzia 2014: 1). For that, see Picture 2 below.



Picture 2. Graphic representation of the results of VAA. Source: Ladner and Pianzola, 2010.

The way how VAAs are created is not the centric issue of this thesis, however, one can say that there are some variations for example in response categories. For example, Stemwijzer was using only very simplistic categories of agreement or disagreement, i.e. ‘yes’ and ‘no’, plus a neutral option (Marschall and Garzia 2014: 2). However, for example in Estonia’s Valijakompass case, users could evaluate on a six step scale, from complete agreement to complete disagreement and no opinion choice (see Picture 1 above). Same categorization was used for Valimismootor³.

Who are using VAAs?

Even though VAAs are becoming more and more widespread and there are no exact groups who are especially using them, it is still claimed that there are certain groups who are more exposed to using VAAs (Wall et al 2009: 6). The main reason for that is that people are experiencing, adapting to and using technology differently. As Wall et al (2009: 20) note, “if VAAs do influence voting behaviour, this influence is unlikely to be spread evenly across the population”.

Therefore, from the perspective of this thesis, it is also relevant to have a look at who the most common users of VAAs are.

³ See on: <http://www.delfi.ee/news/riigikogu2015/mootor/>

Several researches have tackled that question and it turns out that VAAs are most commonly used by young, men, and more educated people who are also interested in politics (Wall et al 2009; Hirzalla, Zoonen and Ridder 2010; Vassil 2011).

As noted above, Hirzalla, Zoonen and Ridder (2010) have found that using Internet mobilizes voters and therefore the effect of VAAs can be seen best on young generation. This can be also supported by the study by Pianzola et al (2012) who investigated the effect of VAAs among Swiss university students in 2011. As one of the weak points is that the sample is not representing the whole Swiss society, I claim that it is an excellent way of showing how VAAs affect young people. As it can be assumed that the majority of those who took part in the study were belonging to young generation they found that after using VAA they were more open to voting alternatives and therefore claimed that they considered more possible opportunities who to vote for. Also Vassil (2011) has found that VAAs are more likely to change young people's vote intention.

When it comes to gender then Van de Pol et al (2014) write that researches have found that men are more likely to use VAA. This most probably comes down to the interest in technology and using it.

Van de Pol et al (2014: 6) also mention that using VAA is also more common among those people who are interested in politics, which means that they are already engaged into politics. As they write, "politically interested citizens will follow political news more closely, and will therefore be the first to notice the availability of a VAA" (ibid.). That means that they are also prone to use it, and those people who are not interested in politics, may even not know about the existence of VAA.

Finally, VAAs are more used among more educated people (Van de Pol et al 2014). This most probably comes down to the fact that educated people tend to be also more interested in politics and therefore they are "overrepresented among the users" (Van de Pol et al 2014: 9).

VAAAs influencing voting behaviour. Research questions

The next section focuses on how VAAAs are claimed to impact voters' voting behaviour. There are several theoretical approaches that can be considered in order to analyse voting behaviour. In this section I will give an overview of rational choice theory, representative deficit, VAAAs as communicative tool, and issue voting. In this part I will also give an overview of hypotheses of this research.

Rational choice theory

Rational choice theory takes cost and utility into consideration. That means that a person compares the cost of going voting (for example gathering information to make a vote choice; also transportation and time go under this category), and the utility or the benefits of it. As Garzia and Trechsel (2017: 3) put it, the main idea of this theory is that the “individual-level probability to cast a vote is inversely proportional to the effort required to gather information”. This can be also described in two equations:

$$pU < C$$

$$pU > C,$$

Where p is probability of casting the decisive vote, U is utility, and C is cost.

The equation above says that the probability of casting the decisive vote times utility (U) is smaller than the cost (C) of casting a vote. If so, then according to rational theory, a voter should not go and vote. If the probability of casting a decisive vote times utility is bigger than the cost, then according to rational choice theory, a voter should go and cast a vote as it is beneficial for her. This situation is depicted in the equation above.

Alvarez, Levin, Trechsel and Vassil (2014) have marked that the cost effect is the one that actually makes people use VAAAs and explains the success of VAAAs among voters. This can be explained through Garzia and Trechsel (2017: 2) who note that VAAAs “provide customized political information”. That means that a person does not have to rank parties or candidates for himself/herself, it has already been done for him/her. “For rational voters, therefore, the benefit from voting had to outweigh the costs for taking part in the collective decision at the polls” (Garzia and Trechsel 2017: 2). Or as Marschall and Schultze (2012) put it, as VAAAs provide comparison of different electoral alternatives

and from the perspective of cost this information is ‘cheap’, VAAs should boost turnout. From that I can form the first hypothesis of this research:

H1: As the cost with using VAA decreases, VAAs should increase turnout.

Representative deficit

Some researches (for example Dinas et al 2014) have pointed also to the fact that VAAs might also have counter-effect, i.e. people may abstain from voting. This was studied through the effect of representative deficit.

Representative deficit means a degree to what extent party or candidate represents voter’s opinions or in larger terms, world view. In simplified terms it means that if a person is a supporter of, say, Reform Party, and according to the results of VAA, the match between the voter’s and the party’s stances of given questions is 70%, then the representative deficit is 30% ($100\% - 70\% = 30\%$). That means that almost one third of user’s views do not match with the ones of Reform Party.

Dinas et al (2014: 9) write that “the lower the deficit, the stronger the self-persuasion, the higher the probability of “switching” party preference to the number one party in the match list”. Also, a psychological effect of going voting can be added here: if the representative deficit is small or low, it may make a person go and vote as s/he sees that there is one party that matches his/her views.

However, Dinas et al (2014) have found the opposite effect as well. That means that the bigger the representative deficit, the bigger is the opportunity to abstain from voting. As noted above, that can again be connected to psychological effect. This means that a person has no psychological or emotional security that s/he should go and vote because either s/he doesn’t feel closeness to any party/candidate or the results from VAA were so confusing that s/he is not sure in the previous decision anymore. Or as Dinas et al (2014: 20) conclude, “the more isolated users realize they are in their political system, the more likely they are to report their intention to abstain because of this outcome”.

H2: As VAAs show the extent of representative deficit, it is also likely that VAAs decrease the turnout.

VAA as communicative tool

In terms of voting behaviour, VAAs can be most probably best described as communicative aspects as in addition to all other possible information sources like print media, television, TV debates, social media, political party websites and statutes etc.

In this case, VAAs are part of political communication and “only one among many competing information sources available to voters during campaign” (Garzia et al 2014: 34). As noted in previous sections, Internet was the main tool that made VAAs available and also more interesting for wider audience. As Hirzalla, Zoonen and Ridder (2010) have written, using Internet mobilizes voters. Their research showed that especially on young generation. Even more, as Ladner, Fivaz and Pianzola (2012) have found, people tend to remember what the VAA suggested and it again increases the likelihood that the VAA has an impact on final vote choice. Vassil (2011) has elaborated on that and finds in his doctoral thesis “that VAAs indeed influence users’ political preferences, vote choice and motivate voters to participate in elections”.

Also, Pianzola et al (2012) have found based on their research among Swiss university students during the 2011 Swiss federal elections that those who used VAA and therefore “were exposed to detailed information about vote alternatives, seem to incline voters to consider these alternative options more closely and include the closest ones as part of their future choice set”.

As an aspect of information, Walgrave et al (2008) have claimed that VAAs actually help to draw voters’ attention to those parties that have been either not having that much attention in public or just broaden voter’s knowledge base in the means of political parties that have similar views to him/her. Eventually, that may mean that the voter changes his/her vote in the future.

Researches have shown that the change in voting preferences can be even larger as the choice that the voter can do is not only between political parties but also candidates (Enyedi 2016: 3). He brings example from Switzerland where 15% of respondents claimed that they voted exactly how VAA responded. In Finland, 7% cent of the respondents in 2003 and 19 per cent in 2007 said that VAAs had an impact on their voting choice, even more, 15% said that they based their electoral choice only on VAAs (Ruusuvirta, 2010; from Enyedi 2016).

However, one crucial point that needs to be brought out is that even though VAAs are information sources and therefore have the power to change people's opinions on one or another party or candidate, it is necessary to point out that it is not sure to what direction voter's voting opinion or preference is changed. That means that the support to the party s/he planned to vote can even increase, however, it can also mean that the choice set can change a lot after using VAA. This is also the basis of the third hypotheses in this theses.

H3: As VAAs are competing information sources and give people comparative information on political parties and candidates in one place, using VAA changes voter's choice set

Issue voting

Somewhat similar to rational choice would be a phenomenon of issue voting. "Issue voting refers to the assumption that vote choice is determined by the individual voter's proximity or distance to or from the position of the parties on salient issues" (Downs 1957; from Marschall and Garzia 2014: 5).

From here, to get the information to decide on the proximity of a party, we need some information. However, getting information comes with a cost, for example we need to give effort and take time to read on parties' or candidates' views on certain issues. VAAs, however, provide already ready information on timely issues, which means that the person needs to spend less time on finding and analysing information (Marschall and Garzia 2014). VAAs do it for him/her. Wall et al (2012: 4) note that VAAs "purport to substantially reduce the cognitive cost needed for a voter to engage in informed issue voting, which can be prohibitively costly due to the time and effort required". They add that "this cognitive price tag" is especially crucial when it comes to countries, which have fragmented party systems a lot of candidates to choose from.

That means that a person might change the final vote choice as s/he finds that some other party might stand closer to him/her on certain topics that the voter finds very important.

H4: voter's final vote choice is more likely to change if the voter used VAA.

Overview of the data and method

This section gives an overview of the data used for this research, also it provides more close overview of the centric research questions tackled in this thesis.

Overview of data

For the analysis I am going to use two datasets, panel data on European Parliament elections from 2014 and survey data on Estonian national elections from 2015.

Tables 1-2. Distribution of respondents included into this research.

Panel data		
	Using VAA	Not using VAA
Going to vote	94 (76,4%)	604 (68,9%)
Not going to vote	29 (23,6%)	272 (31,1%)
<i>Total</i>	<i>123</i>	<i>876</i>

Survey data		
	Using VAA	Not using VAA
Going to vote	122 (91,1%)	688 (79,5%)
Not going to vote	9 (6,9%)	178 (20,5%)
<i>Total</i>	<i>131</i>	<i>866</i>

Overview of the panel data

The panel data I am going to use is gathered by the researchers of Tartu University Johan Skytte Institute of Political Studies Mihkel Solvak and Kristjan Vassil in collaboration with survey centre Turu-uuringute AS.

The panel data was gathered in two waves: the first round was done before the elections, the second one after the elections. For the research phone interviews were conducted.

There were 1500 respondents in the first wave and 1002 in the second one. In the second wave 123 people (12,3% of respondents) claimed that they had used VAA, 876 (87,7%) people claimed that they did not use VAA.

As it is written below, four groups of respondents are formed in order to answer the research questions: respondents who went to vote and used VAA; respondents who went to vote and did not use VAA; respondents who did not go to vote and used VAA; respondents who did not go to vote and also did not use VAA (see Table 1).

There were 94 (74,4% of VAA users) respondents who claimed that they used the VAA and also went to vote. There were 29 (23,6% of VAA users) respondents who said that s/he used VAA and did not go to vote. There were 604 (68,9% of those respondents who did not use VAA) respondents who did not use VAA and went to vote. And there 272 respondents (31,1%) who did not use VAA and also did not go to vote.

This means that out of 1002 people 123 claimed that they used VAA, which means that by and large every 10th person used VAA. The latter is comparable to the VAA usage in parliamentary elections: as there are over 900 000 eligible voters and over 100 000 had used VAA⁴.

Overview of the survey data

In the second part of the analysis, I will use survey data about Estonian national elections in 2015. There were 1007 respondents, out of whom 866 (86,9%) did not use VAA and 131 (13,1%) did.

As seen in Table 2 above, there were 122 respondents (93,1% of those who used VAA) who claimed that they both used VAA and also went to vote, and there were 9 people (6,9%) who used VAA and did not go to vote. There were 178 people (20,5% of those who did not use VAA) who said that they did not use VAA and also did not go to vote during 2015 national elections in Estonia. There were 688 respondents (86,9%) who did not use VAA but voted during elections.

The data was collected by the survey company Saar Poll.

Research method

To find answers to the research questions that I have already mentioned above, I am going to use statistical analysis, using statistics programme Stata. Throughout the analysis I will use logistic regression, which means that I dichotomise several variables, for example using VAA (1-used; 0-did not use), planning to go and vote and actual behaviour, i.e. if a person went to vote or did not. Also, I will include gender, age, interest in politics, and

⁴ See on: <http://valijakompass.dev.err.ee/>

education into the analysis as control variables. The reasoning for that is, as noted in the theoretical part, that VAAs have been more commonly used by young, men, those who are interested in politics and have higher education. Namely, young people are more open to changing their political views as they are not completely formed yet, also younger people tend to be more exposed to technology. The latter is also the main factor among men. Those, who are more interested in politics tend to be also more prone to use VAAs, as they are more likely to find VAAs compared to those who are not.

The next step will be having a more thorough look at research questions and the way I am going to tackle them.

- **Does using VAA influence voting turnout?**

At first, I am going to analyse how VAAs affect turnout. It is especially important in European Parliament elections as they are usually seen as less important and the turnout also reflects on that. This can be shown by comparing participation turnouts in parliamentary and European Parliament elections. In last European Parliament elections, the turnout was 36,5% (in 2004 28,6%, and in 2009 43,9%). In parliament elections the turnout has been around 62-65%, which is considerably higher.

In order to analyse how VAAs impact turnout, I take planning to go to vote and actual voting behaviour into consideration. Then I will add using VAA into consideration to see the effect of VAAs. Control variables such as age, gender and interest in politics are also included.

For this research question I will be using both, panel data on European Parliament elections and also survey data on national elections in Estonia in 2015.

- **Does using VAA change choice set?**

Using 'choice set' in this context is somewhat arbitrary. I will not measure to what extent one or another party's position moved across the respondent's choice set in first and second wave, I only measure if it changed. That means that I do not distinguish positive (the probability to vote for a party has increased) or negative (probability to vote for party/candidate has decreased) movements across the choice set.

Panel data provides information on the choice set of respondents (in questionnaire marked as “What is the probability that you give your vote to following political parties? Please evaluate it on the scale from 0-10 where 0 means that you would not give your vote to this party and 10 means that the probability that this party gets the vote is very high). Respondents could give their evaluations of voting for following political parties: Reform Party, Social Democrats, Centre Party, Pro Patria and Res Publica Union, and Conservatives (EKRE, Conservative People’s Party of Estonia).

By comparing first and second wave responses and adding whether a person used VAA, it is possible to analyse the effect of VAA on choice set.

One critical point that can be brought out here would be that people can also be influenced by other factors to change their vote preference (or leave the same). As the time gap between those two surveys was quite large, people could also gain information from media (newspapers, TV debates, social media etc).

To eliminate this effect to some extent, I will be adding control variables age, gender and education. As seen in theory, those people who are more educated are also less prone to change their choice set as they are usually more informed and also interested in politics. To answer this research question I will use panel data on European Parliament elections.

- **Does using VAA influence final vote choice compared to the intentional one?**

As I enter initial and final vote choice into the regression model, I will be considering four possible combinations of using a VAA and whether a person went to vote.

- Used VAA and went to vote
- Used VAA and did not go to vote
- Did not use VAA and went to vote
- Did not use VAA and did not go to vote

For this research question I will use panel data on European Parliament elections in 2014. I will add age as the control variable.

Empirical analysis and results

In this section I will present the empirical analysis to answer research questions stated above.

Descriptive statistics

First, I will have a look at descriptive statistics to have an understanding of those people who used and not used VAAs. I will bring out the distribution of VAA users/non-users according to age and gender.

Firstly, let us have a look at the distribution of VAA users according to age in two datasets (see Table 3). Firstly, it can be noted that more people have said that they did not use VAAs in order to see what political party or candidate is the closest to them.

As I have a look at the distribution of VAA users across two datasets I can see that younger people are more prone to use VAA. This is also understandable and logical as young people tend to be more computer literate and therefore they are more prone to use VAAs.

Considering those people who claimed that they did not use VAA, then it can be noted again that older people are more likely not to use VAA.

Table 3. Age distribution according to VAA usage.

	VAA			
	Used VAA		Did not use VAA	
	Panel data	Survey data	Panel data	Survey data
18-24	11 (13,58%)	20 (22,99%)	70 (86,42%)	67 (77,01%)
25-34	33 (17,55%)	30 (21,13%)	155 (82,45%)	112 (78,87%)
35-44	24 (14,63%)	31 (17,71%)	140 (85,37%)	144 (82,29%)
45-54	25 (13,59%)	24 (14,29%)	159 (86,41%)	144 (86,71%)
55-64	14 (7,87%)	10 (6,10%)	164 (92,13%)	154 (93,90%)
65-74	16 (7,84%)	13 (7,69%)	188 (92,16%)	156 (92,31%)
75+		3 (3,26%)		89 (96,74%)
<i>N</i>	<i>123</i>	<i>131</i>	<i>876</i>	<i>866</i>

If I have a look at the respondents according to gender, then I see that men are slightly more likely to use VAA than women. This also confirms what I have already mentioned above: it is necessary to include age and gender as control variables into this research. However, as seen in Table 4, across both datasets, not using VAA was heavily more represented than using VAA.

Table 4. Gender distribution according to VAA usage.

	VAA			
	Used VAA		Did not use VAA	
	Panel data	Survey data	Panel data	Survey data
Male	60 (12,93%)	68 (15,42%)	404 (87,07%)	373 (84,58%)
Female	63 (11,78%)	63 (11,33%)	472 (88,22%)	493 (88,67%)
<i>N</i>	<i>123</i>	<i>131</i>	<i>876</i>	<i>866</i>

VAA influencing turnout

The first chapter focuses on analysing the impact of VAA on turnout. In this section I will examine if the VAAs through their communicative aspect make people go and cast their vote in elections.

I will use panel data on European Parliament elections in 2014 and also survey data from 2015 national elections in Estonia. In the first case I will have more broad range how I can approach to the question about the effect on turnout. For example, I can analyse planning to go to vote and actual behaviour separately and measure if VAA has some effect each or both of those variables.

In national elections section, I will only try to find the connection between the voting behaviour, i.e. if a person did go to vote or not and the effect of VAA on that. I also compare the results of those two sections to see if there is any difference in the effect of VAAs between the types of two elections. That means that I try to find out if people are more prone to be affected by VAA when European Parliament or Estonian national elections take place.

As the main idea of this section is to have look at the effect of VAA on turnout, one can have a look at two possible options. Using VAA can make a person go and cast a vote in elections as it informs voter about possible choices and therefore helps make voting decision easier, which may be an important aspect in deciding to go and vote. As I analyse data on European Parliament elections, it is especially important because European Parliament is often referred as something that people do not feel close relationship with. Also, as I have already noted above, the turnout in European Parliament elections is considerably smaller than for instance in national elections.

However, as I consider VAAs an informative tool that finds the closest match to the voter in terms of political parties or candidates, I can also note that using VAA can also cause further confusion and therefore it may hinder person from voting.

Analysing panel data

I will start by analysing the panel data. For the analysis I compose a table to have a look at how many people changed their intent to go voting in general. For that I have a look at how many people planned going voting and actually went to cast a vote. I will exclude those people who did not know about their preferences in one or both categories or did not want to answer questions regarding planning to vote and actual behaviour.

Table 5. People changing their intent of going voting.

	Went to vote		
Planned to vote	0	1	<i>Total</i>
0	134 (92,41%)	11 (7,59%)	<i>145 (100%)</i>
1	107 (14,08%)	653 (85,92%)	<i>760 (100%)</i>
<i>Total</i>	<i>241 (26,63%)</i>	<i>664 (73,37%)</i>	<i>905 (100%)</i>

In Table 5 I have recoded intention and real behaviour into dichotomous categories. Variable “planned to vote” marks if a person had an intention to go and cast a vote. 0 marks that s/he did not have an intention to go and vote, 1 marks that a respondent said that s/he planned to go to vote.

Variable “went to vote” marks real behaviour, i.e. if a person went and casted a vote in elections. 1 marks that s/he did cast a vote, 0 that s/he did not cast a vote.

All in all, I consider the answers from 905 people. As seen in Table 5, 118 people in total changed their preference. That means that they either planned to go and finally did not go or they did not plan to go but eventually still went to vote (in table 0:1; 1;0). From the same table, 787 people did as they had planned (in table 1:1; 0:0). So I can say that less people changed their behaviour.

The next step would be to see if a VAA had a role to play in making that decision. I first test that by simply observing the data.

Table 6. On the left: planning to vote and actual behaviour of people who used VAA (VAA=1). On the right: planning to vote and actual behaviour of people who did not use a VAA (VAA=0).

VAA=1				VAA=0			
	Went to vote		Total		Went to vote		Total
Planned to vote	0	1		Planned to vote	0	1	
0	8 (88,89%)	1 (11,11%)	9 (100%)	0	126 (92,65%)	10 (7,35%)	136 (100%)
1	16 (15,09%)	90 (84,91%)	106 (100%)	1	91 (13,98%)	560 (86,02%)	651 (100%)
Total	24 (20,87%)	91 (79,13%)	115 (100%)	Total	217 (27,57%)	570 (72,43%)	787 (100%)

In Table 6 on the left there are 115 people who used VAA and also stated if they had an intention to go and vote and also if they eventually voted. As of those people who did not use VAA, 787 people responded that question.

As I have a look at the tables above, I see that among those people who used a VAA only 17 changed their behaviour (that is either not planning to vote but still going to vote or

vice versa). Among those who did not use VAA 101 people changed their mind. That means that changing the behaviour was more frequent among those who did not use VAA. In the following analysis I am going to see if VAAs have the effect on changing the plan to go to vote. For that I am going to create another variable called “planned to vote” for those people who claimed that they planned to go to vote in 2014 European Parliament Elections. To mark those people who did not have a plan to go to vote I will add variable “did not plan to vote”. From that, I will compare it to the actual behaviour, i.e. if a person went to vote or not. If the behaviour has changed, for example a person planned to vote but did not go to vote, it will be coded as 1 because the behaviour has changed. If the person planned to vote and did go to vote it is coded as 0 as the behaviour did not change. The coding logic is also presented in Table 7 below.

Table 7. Changing the voting behaviour.

Planned to vote	Actual behaviour	Coded to	Did not plan to vote	Actual behaviour	Coded to
1	0	1	0	1	1
1	1	0	0	0	0

Voting behaviour can be changed by many aspects. In addition to using VAA, also interest in politics is a remarkable aspect that can make people go and cast a vote or vice versa. In the following analysis in addition to see the effect of VAAs on changing voting behaviour I will also add age, gender, and interest politics as independent variables to see if they have an impact on the change in voting behaviour.

I begin with analysing the effect of VAA, age, gender, and interest in politics for those people who planned to go to vote. Let us have a look if VAAs have the power to make people who planned to vote to abstain from voting, i.e. move into direction of not going to vote.

Table 8. Predicting change in intention to go and not to go voting. Average marginal effects.

	M1 (Pr planned to vote)		M2 (Pr did not plan to vote)	
	dy/dx	P> z	dy/dx	P> z
VAA	-0,11 (0,03)	0,757	0,10 (0,81)	0,214
Age	-0,00 (0,00)	0,000	0,00 (0,00)	0,003
Gender	0,00 (0,03)	0,912	-0,11 (0,50)	0,028
Interest in politics			empty	empty
Somewhat interested	0,29 (0,30)	0,330		
A bit interested	0,85 (0,37)	0,029		
Not interested	0,14 (0,06)	0,036		
N	755		131	
Pseudo R ²	0,07		0,27	

As I look at Table 8, I can see that VAA has actually a negative effect, which means that as a person uses VAA, s/he is 11% less likely to change the plan of going voting. However, this is statistically insignificant and therefore I cannot claim that this effect translates to the whole population. More likely, it refers to as using VAA is having a negative effect on planning to go to vote. That means that as a person is already sure about going voting, VAA does not affect or confuse him/her so much that s/he actually makes a decision and does not go to vote.

From other independent variables that I have included, age has a slightly negative effect (as the age increases, the likelihood of changing the initial idea of going voting falls by 0,4%) and it is also statistically important (p=0,000). Gender has slightly positive effect, however, on that question it is statistically not important (p=0,912).

Interest in politics is, however, worth noting if it comes to changing the initial plan of going voting towards not going voting. Among those who are not interested in politics, the likelihood of changing the initial plan of voting increases compared to those who are very interested in politics. Those categories are statistically quite significant if we leave category “a bit interested” or “somewhat interested” aside (p=0,330).

Now let us have a look at model 2 (M2), where the predictable variable is “not planning to vote”. Let’s have a look at if using VAA makes those people who did not plan to vote actually go and cast a vote.

As it can be seen, VAA has a positive impact on changing the initial plan of not going voting (using an VAA increases the likelihood of changing the initial plan of not going voting to voting by 10%), however, it is statistically not important ($p=0,214$) and I cannot claim that it reflects the whole population.

Age as a positive impact on changing the initial plan of going voting, however, the effect is very small. The likelihood increases only by 0,4%. It is statistically important, though ($p=0,003$). Gender has a negative effect, which means that women are 11% less likely to change their initial plan of voting. As with age, I can claim that it is by and large statistically important ($p=0,028$).

Unfortunately, in that case there are too few examples to include in the analysis to see the effect of interest in politics and therefore that column is empty.

One further option here would be looking the interaction between using VAA and interest in politics and its effect on having or not having the intention of going voting. However, as there are too few cases under each category in interest in politics section, it is not possible to test it on this dataset.

Testing Estonian national elections data

Compared to the previous section, I will have a look at the same research question again, but this time I test it on national elections data from 2015, i.e. during the last national elections in Estonia. For this, I only have survey data that I can use to measure and have a look if VAAs are having an effect on turnout, and on the contrary, if using VAA can be actually predicted by the voting behaviour, i.e. if the person voted or not. Later in this section I will also try out interaction, the one that we could not do because of the lack of cases in the panel data.

Firstly, I will have a look how many people used VAA. In total there were 1007 people who answered that question and out of those 10 people did not want to answer or did not remember using VAA. I will exclude those 10 people from the analysis and continue only with those who claim that they had or had not used VAA. As in the section above, I will

dichotomise those answers and create new variable VAA, where 1 means that the person used VAA, and 0 means that the person did not use VAA.

As seen in the very first part of the analysis, i.e. descriptive statistics, answers from 997 people are considered, and out of those, 866 people or almost 87% claimed that they did not use VAA. 131 or 13% claimed that they had used VAA.

Next, I will have a look, how many people had claimed that they voted in national elections in 2015. Again I consider the answers from 1007 people and out of those 817 or 81% claimed that they had voted. 190 or 19% said that they did not vote. There were no people who said that they did not want to answer that question or they did not remember going or not going voting.

As with the usage of VAA, we also dichotomise going voting and generate variable called “went to vote”.

As seen in descriptive statistics part, 866 people did not use VAA and out of those, 688 went to vote. There were 131 people total who used VAA and out of those vast majority also went to vote, i.e. 122 people (93%).

The next step would be to have a look at the connection between going to vote and VAA. In Table 8 Model 1 (M1) helps us understand the effect of VAA to going voting. We can see that using VAA has a positive effect. It is also statistically significant ($p=0,000$). That means that if a person uses VAA, the likelihood that s/he goes to vote increases by 19%.

Table 9. Going to vote predicted. Average marginal effects.

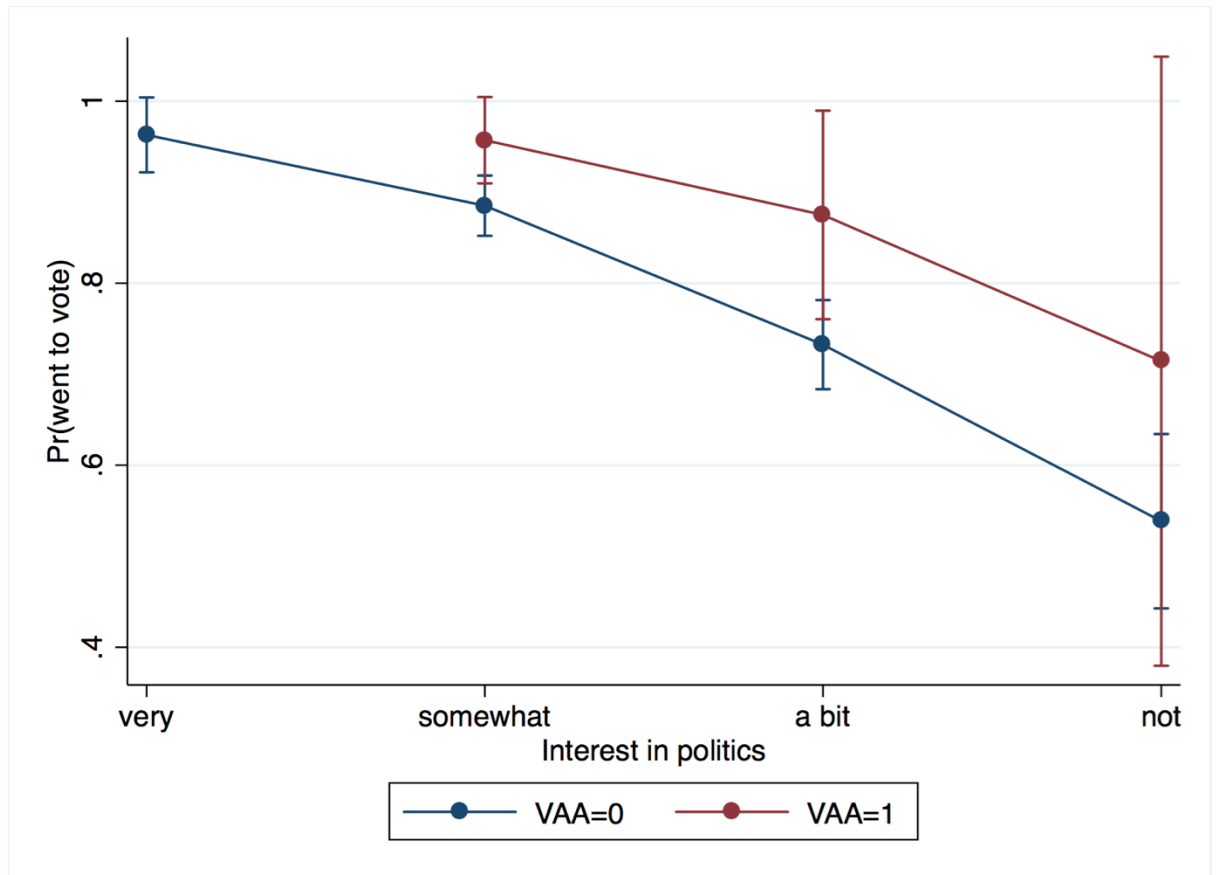
	M1		M2	
	dy/dx	P> z	dy/dx	P> z
VAA	0,19 (0,53)	0,000	0,16 (0,49)	0,002
Age			0,02 (0,01)	0,008
Gender			0,03 (0,02)	0,184
Interest in politics				
Somewhat interested			-0,07 (0,02)	0,003
A bit interested			-0,20 (0,03)	0,000
Not interested			-0,39 (0,50)	0,000
<i>N</i>	997		986	
<i>Pseudo R</i> ²	0,02		0,12	

As I did in the first part of this section, in addition to VAAs there are also a number of other possible variables that help predict if a person went to vote or not. Let us have a look at Table 9 model 2 (M2) where going voting is predicted by using VAA, and also age, gender, and interest in politics. In latter case, category “very interested” is used as a reference category.

As it can be seen, VAA is still important in predicting if a person went to vote. The statistical significance has somewhat decreased (from $p=0,000$ above to $p=0,002$ here) but can be said is still significant. As I have a look at the effect of VAA, then if a person used VAA the probability to vote increased by almost 16%. Age and gender have also positive impact on going voting, however, it is very small and also they are statistically less significant compared to the effect of VAA.

As I have a look at the interest in politics, the less interested a person is in politics the less probable it is that s/he goes to vote. In this case, “very interested is a reference category. Those people who are not interested in politics at all are 38% less probably going to vote than those who are very interested in politics. Also, as the interest in politics “decreases” the smaller the chance that person goes to vote. This is also logical and expected.

In addition to that, I can also have a look at the relationship between VAAs and turnout by trying out interaction. I will take going to vote as dependent variable. I will have a look at the interaction of VAA and interest in politics in going to vote.



Graph 1. Interest in politics and using VAA in interaction to explain going voting.

As I look at the Graph 1, both blue ja red line (not using and using VAA accordingly) have negative slope.

Let us have a closer look at those people who used VAA (VAA=1). In this case negative slope can be seen, which means that among those people who used VAA, as the degree of interest in politics decreases, the smaller is the probability that a person went to vote. As VAA should be considered as a communicative tool and an application from where information comes in low cost, people who are not interested in politics at all should also according to theory be more prone to go voting. Furthermore, I can note that among those who are interested in politics and also use VAA, the probability to go to vote is high. This

may mean that people use VAAs only to reassure voting choice or they use it simply out of interest, but not as a tool that really affects their decision whether to go to vote or not. In wider context this can be interpreted as a classic example of bottleneck theory. Vassil and Weber (2011: 2) have used it in the context of mobilizing voters to use e-voting in Estonia, however, the same logic can be also presented in this case. If we think about e-voting and using VAAs, the common trait they share is they they created through technology and in terms of voting they can be considered as advanced tools of voting or helping voting.

Vassil and Weber (ibid.) continue that those people who are more interested in politics are “generally also more experienced with computers and the internet”. That means that they are more exposed to using VAA as they have information on them and can also find an access to it. So, putting that into the context of this research: those people who are not interested in technology are therefore in a way trapped: they do not have information about using VAA or they simply cannot do that. The probability for that is even bigger in the case of European Parliament elections as they are typically more overlooked by people.

The result of all of it is that VAAs are used by people who are interested in politics and may already have a fixed opinion on who to vote for. To them, the mobilizing effect is smaller. From the other hand, those people who are not interested in politics and therefore should “need help” in deciding who to vote for and through that push them towards going voting, are trapped as they do not have an access to VAA or they do not even know about its existence. On the basis of my analysis I can claim that as European Parliament elections are less important for people, the bottleneck effect is even greater.

The blue line marks respondents who did not use VAA ($VAA=0$). Again I see a negative slope, which means that among those who did not use VAA and who are less interested in politics, are also less likely to go to vote. This is logical and expected.

Comparing two datasets

The last section of the turnout part would be the comparison of two datasets. In this case I take “went to vote” as a dependent variable and VAA, age, gender, and interest in politics as independent variables.

The main reason for comparing two datasets is from one hand to see the effect of VAA on going voting but more importantly, is there any difference in what elections voters are participating in. As noted above, the turnout in European Parliament elections has so far been way smaller than in the national elections.

Table 10. Comparing two datasets where “going to vote” is a dependent variable. Average marginal effects.

	M1 (panel data)		M2 (survey data)	
	dy/dx	P> z	dy/dx	P> z
VAA	0,07 (0,04)	0,141	0,16 (0,49)	0,002
Age	0,01 (0,00)	0,000	0,02 (0,01)	0,008
Gender	0,02 (0,02)	0,531	0,03 (0,02)	0,184
Interest in politics				
Somewhat interested	-0,02 (0,03)	0,589	-0,07 (0,03)	0,003
A bit interested	-0,17 (0,04)	0,000	-0,20 (0,03)	0,000
Not interested	-0,36 (0,06)	0,000	-0,39 (0,50)	0,000

It can be seen that in both cases that using VAA has positive effect on going to vote, also in the case of Estonian national elections (M2, survey data) it is also statistically significant. That means that as people use VAA, the likelihood that they go to vote, increases. However, here in the case of panel data (M1) it is statistically insignificant ($p=0,141$).

Age and gender also have positive impact on going to vote, however, the effect is very small (the older the people the more likely they are going to vote) and also not in all cases they are statistically significant.

Interest in politics also offers comparable data and it can be seen that the tendency is the same: the less interested people are in politics, the less likely they are to go to vote. Those variables were also almost in all cases statistically significant (besides “somewhat interested” in M1).

What can be concluded here is that in both cases the effect of VAA usage is the same. However, in the case of survey data it can be considered as statistically significant, whereas in the case of panel data the finding is statistically insignificant. This can also be the point from where it is possible to draw conclusions on VAA usage and its effect on different types of elections.

As it is already noted above, Estonians tend to care more about national elections. That means that they feel participating there is citizen duty and it is also reflected by the relatively high turnout. However, the case is almost vice versa in terms of European Parliament elections.

When it comes to analysing the effect of VAAs on turnout, then in theory in both cases VAA should have a positive effect on it. Even more, as VAAs are communicative tools and using it takes little time and effort (rational choice theory), the mobilizing effect should be even bigger in the case of European Parliament elections as it offers all of the information in one place and should convince people relatively easily to go and cast a vote.

However, the numbers in the table show different situation. In the case of national elections, the mobilizing effect can be seen, however, as the result of analysing panel data is statistically insignificant, it shows that the effect of VAA is not that strong.

VAA influencing choice set

The second chapter is about influencing the choice set of a voter. In this section I will examine if the voter has changed his/her party/candidate preferences based panel data on European Parliamentary elections in 2014.

The term ‘choice set’ in this analysis is somewhat arbitrary. I only consider if the voter has changed her/his preference when s/he has also used VAA. That means that I will again use dichotomous categories where 1 marks if the voter has changed the positioning of the political party or candidate, and 0 marks if it has stayed the same. Also, in this case it is not important if the likelihood that the party/candidate gets her/his vote has increased or decreased.

As already noted in the theoretical part, it is important to understand that daily we consume different kinds of information. We use social media, we read newspapers, watch

political debates on TV etc. That means that even if we test the effect of VAA, we cannot surely claim that this is the tool that actually helped move the likelihood of voting for party/candidate. Instead, based on the statistical analysis I can assess if the VAA has had an important role to play in political party/candidate preferences by measuring if the probability of voting for a party/candidate has changed.

Testing the data

Let us have a look at the panel data on European Parliament elections. In survey, people are asked, how possible is that they give their vote to following political parties: Pro Patria and Res Publica Union, Social Democratic Party, Reform Party Centre Party, and Conservative People's Party of Estonia. Respondents assessed the likelihood on 10point scale.

First, I will have a look at the relationship between the change in support for the Reform Party and using VAA. For that I generate variable *reform*. In both waves, respondents answer the question about the probability of giving the vote to one or other political party. I will subtract one wave's answers from another. Then I dichotomise the *reform* variable and mark 1 if the probability has changed. I mark 0 if the person is giving the same number of points for the probability to vote for the party.

Next, I will do a logistic regression where *reform* is dependent variable and VAA independent variable. I will do the same with other four political parties as well, Pro Patria and Res Publica Union, Social Democratic Party, Centre Party, and Conservative Party. After that, I add a number of independent variables such as gender, age, and education.

Table 11. VAA, gender, age, and education level predicting change in the probability to vote for the political party. Average marginal effects.

	PPRPU	Social Democrats	Reform Party	Centre Party	Conservatives
VAA	-0,035 (0,046)	-0,035 (0,045)	-0,001 (0,47)	-0,019 (0,048)	0,019 (0,054)
Gender	-0,008 (0,031)	-0,041 (0,031)	-0,036 (0,031)	-0,045 (0,032)	-0,050 (0,038)
Age	-0,002 (0,000)	-0,000 (0,000)	-0,003 (0,000)***	-0,002 (0,001)**	-0,004 (0,001)***
Education	-0,004 (0,007)	0,003 (0,007)	-0,008 (0,001)	-0,004 (0,007)	-0,013 (0,001)
N	949	881	919	930	644

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$. Standard errors are in parentheses.

Table 11 depicts the role of VAA in changing the probability to vote for a political party. In cases of Pro Patria and Res Publica Union, Social Democratic Party, Reform Party and Centre party, VAA plays a negative role, i.e. a person who is using VAA is actually not more prone to change the probability to vote for the party (remember, 1 marks the change in probability to vote for, 0 staying the same). The reason behind that might be that voters who are planning to vote for named political parties are more sure about their vote choice. Also, those who do not support those parties or are neutral, they do not change their views. In the case of Conservative Party, the likelihood of the change in the probability to vote for a political party increases. That means that those voters who have planned to vote for Conservatives are more prone to change the probability of voting for that party. However, as I consider increasing and decreasing of the probability as the same, I cannot say if the probability changes towards increasing or decreasing. None of those results is, however, statistically significant.

Gender has negative impact in change of the probability to vote for a political party, age has only in the case of Social Democrats a positive effect. In cases of Reform Party,

Centre Party and Conservatives it has a negative effect. Also, in those cases age is also statistically important. That means that as the age increases, the less likely people are to change the evaluation of the probability to vote for a specific political party. This is also logical and expected.

The last independent variable included into this particular analysis was education. As with almost all other variables, it is also statistically not significant. In the case of Social Democrats, the higher the education, the more prone is the voter to change the likelihood of giving his/her vote to Social Democrats. In cases of Pro Patria and Res Publica Union, Reform Party, Centre Party and Conservatives, the higher the education, the less likely it is that the person changes the probability to vote for that party. This, indeed, is also expected as for those people who have higher education, have also most probably more formed political views and opinions. Also, they might consume more media and information to have those views formed.

One option would be to try out interaction between the independent variables, unfortunately I cannot do that as there are too few cases to include into each category and some categories are also empty according to Stata.

VAA influencing final vote choice

In the final section I will analyse the effect of VAAs on final vote choice. In this section I will use panel data as it provides information on before and after making the vote choice. I start by making clear how many people were answering the question on VAAs. In the second wave respondents are asked whether they used VAAs or not. From the perspective of the following analysis I will exclude those respondents who claimed that they did not know if they used VAA or not. As in the second wave I have 1002 respondents and 3 of them said “I do not know”, I am left with 999 respondents.

The next step would be comparing the voters’ voting choices. In the first wave, respondents were asked which candidate or political party the respondent plans to vote for. In second wave their actual vote choice was asked. Making sure if the person has changed his/her voting choice, the easiest way is to subtract the second response from the first one. For that I create a variable called “vote intention”. As above, in this case I will also exclude those candidates/parties that were mentioned in the first wave and not the

second, also, I will exclude those respondents who did not know or did not want to say either their first or final vote choice. Eventually there are 370 cases left, where 320 respondents or 86,5% voted for the same party they intended to, and in the case of 50 respondents or 13,5% vote intention and final vote choice did not overlap.

Voting preference explained

From here I can create a basic logistic regression model where “vote intention” is the dependent variable. I can create three models that help us understand the effect of VAAs.

The first model would be simply to have a look at, whether VAAs can affect changing voting intention. The explanatory power of Model 1 (see M1 in Table 12 below) is however basically non-existing. VAAs have the positive effect on changing intention. However, it is statistically not important ($p=0,090$), which means that based on that it is not possible to make any further conclusions on how VAAs influence vote choice.

However, in that regression model only one independent variable used, which means that all respondents were treated as a one homogeneous group. One possible way to dig deeper into this research question would be adding another variable. In this case I can use respondents' age (see M2 in Table 12). It can be seen that compared to M1 the effect of VAAs to voting preference slightly decreased, however, it is still a positive effect. Age, on the contrary has negative effect on changing the vote choice, which means that if people get older, they are less likely to change voting preference. This is also expected as young people usually do not have already formed and fixed political preferences. As in M1, none of those independent variables is, however, statistically significant. Also, the explanatory power of M2 is very low.

Next option would be to see the effect on changing voting preference by looking the effect of VAAs and also age groups. In model 3 (see M3 in Table 12) I can see that the effect of VAAs is almost the same as in M2, and it is also again statistically insignificant. However, as I have a look at the effect of age in changing voting preference, then model 3 clearly opens that picture up more. In M2 I saw that the older people get the less likely they are to change voting intention. In M3 we see that comparing to 18-24 year olds (reference group), those people who belong to groups 35-44 and 65+ are less likely to change it. This is, in fact surprising as it would have been expected to be so in last two age categories. As with M1 and M2, also in M3 neither of the independent variables is

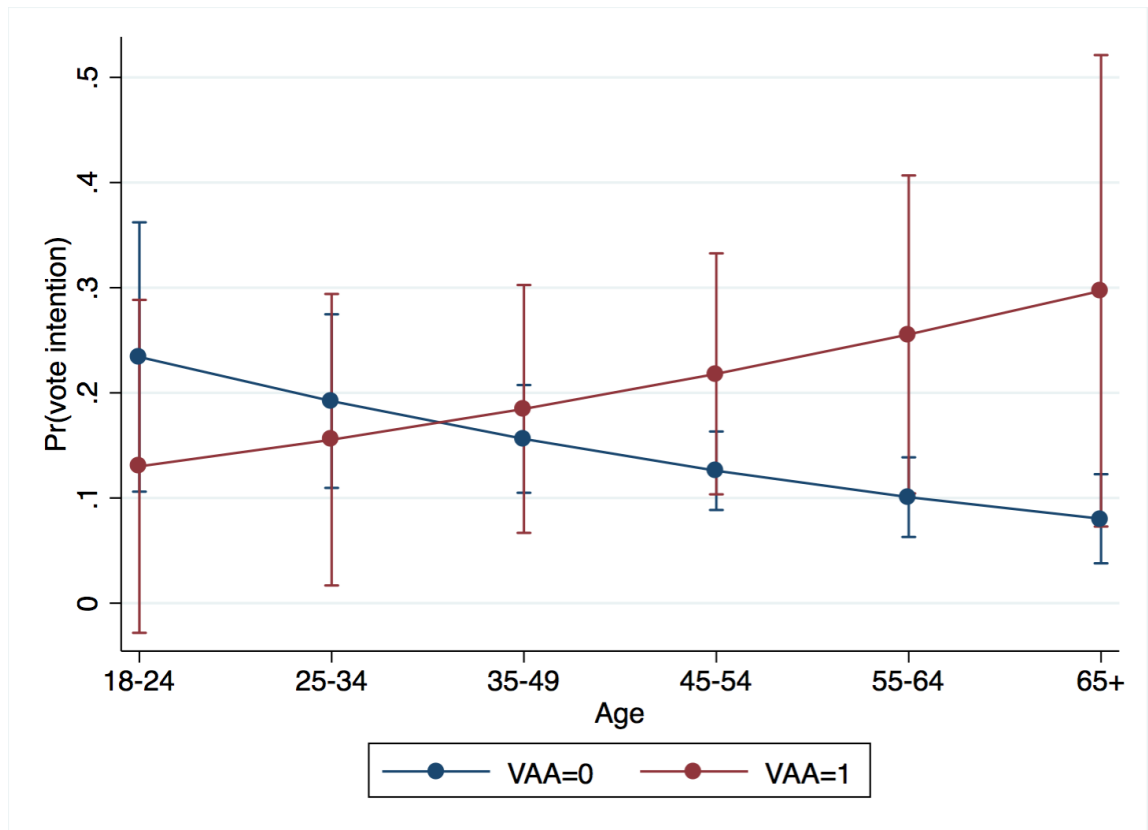
statistically significant. Also, in M3, the explanatory power of the model is almost non-existent.

Table 12. Predicting the voting preference. Average marginal effects.

	M1	M2	M3
Const.	-1,96 (0,17)	-1,27 (0,50)	-1,93 (0,77)
VAA	0,64 (0,38)	0,54 (0,39)	0,55 (0,40)
Age		-0,01 (0,01)	
18-24			
25-34			0,48 (0,83)
35-44			-0,34 (0,90)
45-54			0,51 (0,84)
55-64			0,32 (0,82)
65+			-0,73 (0,86)
<i>N</i>	368	368	368
<i>Pseudo R²</i>	0,009	0,016	0,036

** $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$. Standard errors are in parentheses.*

Another possible option to analyse this questions is to look at the variables from the perspective of interaction. This means that it is always not sufficient to look at dependent and independent variables but also look at how independent variables interact, i.e. are connected to each other. In this section I will examine the interaction between using VAA and age and finally I will put voting preference into logistic regression with interaction between independent variables.



Graph 2. Voting preferences explained by the interaction between using VAA in different age groups.

Graph 2 shows that older people who are also using VAA are more likely to change their vote intention than is the same case with younger people. This is total opposite what can be seen in theory. From theory I would have expected that young people who are also using VAAs should be more prone to change their vote as they are more easily influenced by different information sources, and as we already know, VAA is one of the competing information sources.

As I have look at the blue line and analyse people who have not used VAA then their vote intention is less likely to change as the age increases. This goes also against the theory as I would have expected that young people in general are more prone to change their vote intention than older people.

Still, one thing that catches the eye is the older generation and the difference between minimum and maximum value in probability to change the voting preference. The whisker, i.e. the gap between the upper and lower 95% confidence interval is worth

examination. In the beginning of the analysis it is clearly seen that there were less people representing the older generation. That means that the large gap can actually be explained by the fact that among VAA users there were few respondents who belong to age group 65+. That means that each respondent's answer has a bigger weight in changing the overall effect of VAA in the same age group. Also, it is possible to play with the idea that those people who belonged to older generation and were included in the research might be part of a tech-savvy group, which means that they are also prone to be affected by the VAA even if they belong to older generation.

Results

The aim of this master thesis was to contribute to opening up the world of VAAs and their effect on voters' voting behaviour. VAAs have been around for quite a long time and become an essential part in making final voting decision for many people.

In the beginning of this research I posed three questions: how voting advice applications influence turnout; how do VAAs change or affect voter's choice set; and finally, how do VAAs influence the final vote choice. I used several logistic regression models and tested them on two datasets: panel data from European Parliament elections in 2014, and survey data on Estonian national elections in 2015.

In next paragraphs I will give an overview of the results of my analysis and then continue with wider discussion of VAAs based on the results of my analysis.

Effect on turnout

The first research question I tackled was about turnout. Considering theory, rational choice theory should be one possible way of explaining that people go and vote. As using VAA is simple, quick and it presents comparable analysis for the user, it acts as an application where all necessary information is brought together. As using VAA is simple and it takes quite little time, the effort that a person has to give (compare it for example to reading parties' manifestos and listening and/or watching TV or radio debates), decreases significantly. Based on that people should go and vote.

Also, as we consider VAA as communicative tool, it may increase voters' interest in politics and therefore also bring new people to participate in elections.

As I conducted my research, I found that based on two datasets, panel data and survey data, VAA acts more like a control mechanism. That means that people who were going voting were also more eager to use VAA. Therefore, I can conclude that new people actually did not come to vote. This is an example of typical bottleneck theory that is used in explaining and analysing the effect of technology on people. As technology makes participating in elections easier, it should benefit those who are not very interested in politics by making voting choice easier and bringing them to vote. However, as those people who are not interested in politics, are also less exposed to such tools as VAA, there is a big probability that they have not even heard about such possibility. And therefore those who should benefit the most by it, are left aside.

Changing choice set

The second section was devoted to see the effect of VAAs on voter's choice set. As I have noted above several times, using the term 'choice set' here is not entirely correct. In terms of choice set I only had a look at if the positioning of a political party has changed. It means that in this case it did not matter whether the party's position had increased or decreased. Also, I did not count in the extent of the change in positions.

When we come back to theoretical framework then again, many possible explanations can be found to explain the change in choice set. One option would be, of course, rational choice theory as voting for some parties may be more useful from the perspective of voter and final electoral outcome. Also, VAAs act as communicative aspect, which means that based on the results of VAA and of course other possible communicative mediums that surround us, voter decides to change the list of parties that might get his/her vote, or simply re-evaluate the likelihood of voting for one or another party/candidate.

The results of the second part of my thesis in a way reflect the ones from first chapter: people who used VAA did not really change their choice set, which can be interpreted again that VAA acts as a control mechanism. In the Estonian political party landscape only party that stood out in this case were conservatives. That means that if a person thinks s/he is a supporter of Conservative party (in Estonian EKRE), s/he might change that after taking VAA.

Changing final vote choice

The last empirical chapter was about changing the final vote choice. After the analysing the effect of VAAs on the actual vote change I can conclude that I saw some kind of negative effect, i.e. the vote preference is more likely to change if a person uses VAA. However, in statistical terms I cannot make a strong conclusion on that as almost all our independent variables were insignificant.

As I put interest in politics and using VAA into interaction when predicting the change in vote choice, I saw that older people using VAA are more likely to change their voting preference. As we consider theory, it was quite unexpected. However, this can be explained by small number of respondents in older age groups, and also the fact that those respondents might belong to a certain group of people who are affected by the VAA even if they are older.

Discussion

The final section before summary is devoted to discussion. In this section I will have a look at the results one more time and compare them with the theory and also try to think further on the effect of VAAs on voting behaviour. In this section I will also give an overview of the weaknesses of my analysis and their effect on outcomes. Final paragraphs of this section will be about suggesting some topics for further research on voting advice applications.

The effect of voting advice applications on voting behaviour has been studied quite a lot, however, so much is yet to discover. My research was built on two datasets, panel data on European Parliament elections in 2014 and survey data on Estonian national elections in 2015. The strength of panel data is that it is possible to measure voting behaviour for the same people before and after the elections. This means that it opens up more on how people are affected by communication mediums, to which category VAAs certainly belong to.

Survey data, however, was chosen because European Parliament elections tend to be more second category elections for Estonians. As it mentioned several times before in this thesis, the differences between turnouts in European Parliament and national elections are quite remarkable. Unfortunately, panel data has not been gathered for national elections. Main reason for that is most probably money as making such research is very expensive. However, from the perspective of academia and further research, it would be very interesting to see, what kind of results can be seen when analysing panel data on national elections in Estonia. The turnout in national elections has always been quite solid as I consider that in Estonia it is not compulsory to participate in elections.

Trapped in bottleneck

The fact that I study two different elections is one of the core ideas if I consider the result of the first part of my analysis, which is the effect of VAAs on turnout. I was especially interested in the effect of VAAs on European Parliament elections as according to theory VAAs should be like an educating tool for people. If I think back to theoretical part, then VAAs are considered as communicative tools. However, what distinguishes it from the rest of mediums like newspapers, news portals, TV debates, it actually does all the work for the voter: it asks questions on timely issues, it compares the stances of a person to the

ones of political party or candidate. After that, it shows comparison, which parties match people the most and which have less in common with the voter. Easy, isn't it!? The word 'easy' is especially important in this context as I think back to the rational choice theory: if it takes me such a small amount of time to do the VAA and get all the necessary information to form a vote choice, why not to go and vote?

In the case of European Parliament elections, this theory did not seem to work. Respondents who already had the plan to go and vote were more prone to use VAA. If I step a bit back from it, then it can be questioned, if a person already knows who to vote for, why bother using VAA after all? One explanation to that can be that people were using VAA as a control mechanism and therefore the overall power of VAA to bring people to vote was not represented based on this dataset. Those people who are interested in politics anyway and who are more prone to use technology and such tools as VAA, were using it and therefore the overall aim of VAA was in a way defeated.

If I consider that VAA did not appear to have a strong impact of making people go and vote, I can also say that this is a typical example of bottleneck theory. As noted already above in the analysis part, those people who are more exposed to technology can actually have less use out of VAA. Technology makes going voting (or voting, depending on context) easier and should make those who are not into politics, go and make a vote choice. Based on my analysis, however, it can be seen that people who should have most use out of VAA, were trapped in a bottleneck and therefore I could not see the effect of VAA on turnout.

Changes in choice set

The second part of my analysis was devoted to choice set, which, as seen and also mentioned before, is a bit arbitrary. I did not measure changes in choice set as such but more if the changes appeared. That means that if a person claimed that s/he has changed the likelihood of voting for, say, Reform Party, then it was enough for my analysis. I did not consider separately, if the result was that s/he is now supporting Reform Party more or less. Even though it can be counted as a weakness of my thesis, I claim that if there were some effects on the change in choice set I would have also investigated them further. However, based on my analysis the effect of VAA was there but it was statistically insignificant. Leaving that aside, I found that in the cases of Reform Party, Centre Party, Social Democrats, and Pro Patria and Res Publica Union, voters are less likely to change

their probability to cast a vote for that party. However, in the case of Conservatives (or EKRE, in Estonian), the effect of VAA on the probability to vote for that party was opposite. One reason for that may be that Conservatives are widely considered as populists in Estonian society and therefore it might come as a surprise for people who do VAA that they have way less (or more, as I did not distinguish increase or decrease in the probability to vote for that party) in common with EKRE as they initially thought.

Not powerful enough

The final section of this analysis was about final vote choice where I compared the vote intention to vote choice. I found that VAA has a positive effect on the change of vote choice, which means that those people who were using VAA, were also more likely to change the vote choice. There can be two explanations for this. Firstly, people saw that some other political parties/candidates have more close opinion to them in topics that the voter considers more relevant (for example health care, education, defence policy and so on). This, as seen in theory, refers to issue voting that is based on the latter idea. The other way can be, again, seeing the VAA as a communicative tool that was among those that finally helped to shape voter's opinion. I say VAA was among communicative tools, as there was a gap between first and second wave of the survey and people get information from a wide variety of sources.

In terms of VAA and its effect on final vote choice I would have expected according to theory that the effect is strong. If I look at the results of my analysis, then I definitely see the effect of VAAs, however, it is statistically insignificant. This is actually surprising especially as in that section I was studying panel data on European Parliament elections. The fact that in statistical terms I did not find anything in this section shows that the VAA was not that important tool for shaping people's decision who to vote for.

One of the possible critique points in this case can be that there were too few cases to base the analysis on. Even though I have claimed above that out of 1002 people 123 or every 10th used VAA, the number is very small to claim the effect of VAA. Especially as there were 29 respondents who said that s/he used VAA and did not go to vote. That number is very small if I want to compare the effect of VAAs on voting behaviour as I consider that there were 604 respondents who did not use VAA and went to vote and 272 respondents who did not use VAA and also did not go to vote. I still claim that the effect

would have been present also in this case, so in my opinion it is quite safe to say that the effect of VAA on the respondents of that research is still weak.

Suggestions for further research

Based on this analysis and also my readings on VAAs, I would like to finish my thesis by offering a few ideas that can be considered when further studying VAAs and their effects on voting behaviour in the future.

Firstly, even though it does not depend that much on a researcher or analyst, I think that it would be very important to have panel data also on national elections. Panel data, compared to simple survey data gives more opportunities to study the effect of VAAs even more as same people are questioned before and after elections.

Secondly, I would also like to offer the idea of using different research methods to tackle the question of VAAs and their effect on voting behaviour. Besides quantitative methods it would be also interesting to study the same topic by using qualitative methods. One option would be letting people do the VAA and after that do focus group interview where they can discuss and open up about the results of the VAA and how they compare to their opinions and expectations. I find this especially interesting in the time of alternative facts and populism where people can be easily distracted by what they see and read in traditional, alternative, and also social media.

Thirdly, I would propose the same idea I was once playing with myself: doing laboratory experiment and measuring how people's opinions change in a small amount of time. Compared to panel data, there is a small time gap between answering questions before and after doing VAA, which means that the effect VAA alone is exposed way more than for example in this research.

Summary

The aim of this master thesis was to analyse the effect of voting advice applications (VAAs) on voting behaviour. I was measuring the effect of VAAs on turnout, on choice set and on final vote choice. I was studying those questions based on two datasets: panel data on European Parliament elections in 2014 (for all three research questions) and simple survey data on national elections in 2015 (for turnout section).

Statistically speaking, the results of my thesis were insignificant, however, based on my analysis I could show the typical effect of bottleneck to the turnout, also the fact that the effect of VAA actually depends on type of elections (European Parliament ones or national ones). However, the effect I got based on my analysis, was rather contradictory as I would have expected based on theory stronger effect on European Parliament elections.

My analysis showed that VAAs do not have strong effect on changing the choice set. Also, there was positive effect on changing final vote choice, however, the effect was not that strong to consider it statistically significant. Therefore, I claim that the effect of VAA was not that strong based on that dataset as even with small number of cases it would have still appeared.

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